TRIMPACK

GPS Receiver

Operation &
Maintenance Guide

Includes Have-Quick Option

TrimbleNavigation

WARRANTY

As an expression of confidence in our products to continue meeting the high standards of reliability and performance that our customers have come to expect, Trimble Navigation products are covered by a limited warranty, as described in the *TRIMPACK™ Specification, Installation, and Reference Manual,* Part Number 13498.

For warranty repair, please call (800) 334-9595 (outside California) or (408) 737-6940 (inside California) to request an RMA number from the Service Representative. Ship the equipment (with RMA number noted) to Government Operations, Trimble Navigation Ltd., 617 North Mary Avenue, Sunnyvale, CA 94086. See the Warranty Return Procedures and Warranty Return Form on the last page of this manual.

MANUAL IMPROVEMENT

Please help improve our manuals by sending comments and suggestions to our headquarters in Sunnyvale, California (*see address on the rear cover*). Thank you.

TRIMPACK is a trademark of Trimble Navigation Limited

TRIMPACK

GPS Receiver

Operation & Maintenance Guide

Includes Have-Quick Option

Part Number 13468
Revision C

Printed in USA
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GLOSSARY

The following terms and abbreviations are used in this manual:

AVG	Averaging mode
ALT	Altitude
AZM	Azimuth (Bearing)
COG	Course over ground
CONUS	Continental United States
DEC	Decrement
DEG	Degrees
DIST	Distance
DM.	Degree, Minutes, Decimal Minutes coordinate system
DMS	Degree, Minutes, Seconds coordinate system
Dn	Down
EXT	External
FIX	Position fix
GMT	Greenwich Mean Time
GPS	Global Positioning System
INC	Increment
INT	Internal
Km	Kilometers
KPH	Kilometers per hour
KTS	Knots
L	Left
Lat	Latitude
LCD	Liquid Crystal Display
LOC	Local (time)
Lon	Longitude
m	Meters
MG	Magnetic north reference
MGR or MGRS	Military Grid Reference System
MIL	1/6400th of a circle
MPH	Miles per hour
NAD	North American Datum
POS	Position
R	Right
R+A	Range and azimuth
RADS	Radians
rng	Range
SPCL	Special
SOG	Speed over ground
srg	Slant range
SV	Space vehicle or satellite
STS	Status
Tr	True north reference
ttg	Time to go
UTC	Universal Coordinated Time (same as GMT)
UTM	Universal Transverse Mercator
vel	Velocity
vrt	Vertical
vta	Vertical angle
WGS	World Geodetic System
WPT	Waypoint
xte	Crosstrack error (L or R)
2-D	Two dimensional
3-D	Three dimensional
°C	Degrees Centigrade (Celsius)
°F	Degrees Fahrenheit

Days of the week: SUN MON TUE WED THU FRI SAT

Latitude and Longitude hemispheres:
N (north) S (south) E (east) W (west)

Great Circle: The shortest distance between two points on the surface of a sphere.

WARNING

The battery pack at the rear of the TRIMPACK may contain lithium batteries. Lithium batteries contain flammable materials and require special handling. To prevent rupture or leakage of battery fluid, the following safety precautions MUST be observed:

- **Do not** puncture batteries.
- **Do not** short circuit batteries.
- **Do not** heat batteries or place them in fire.
- **Do not** recharge lithium batteries.
- **Do not** install batteries backwards.
- **Do not** dispose of discharged batteries except as prescribed in Federal and State regulations.
- **Do not** leave loaded battery pack in the direct sunlight for extended periods.
- **Do not** leave loaded battery pack inside closed vehicles exposed to the sun.

WARNING

The case of the TRIMPACK conducts electricity, even though it is made of plastic. When connecting the unit to an external power source, be careful to avoid electrical shock just as if the case were metal.

Failure to heed these warnings may result in personal injury or death.

CAUTION

The TRIMPACK is designed for rugged use in difficult field environments. It will operate continuously in air temperatures from -30° to +65°C (-22° to +150°F) and in environments with up to 100% humidity. However, take reasonable care of the unit as with any other piece of high-precision equipment.

TRIMPACK
QUICK REFERENCE GUIDE

SETTING UP FOR A MISSION

Use STS switch position to:

1. **Choose Datum**
2. **Choose Coordinate System:** DMS, DM., UTM or MGRS
3. **Set Operating Parameters:**

Time:	UTC or Local
Distance Units:	English (feet, miles, miles per hour), Metric (meters, Km, Km per hour), or Nautical (feet, nautical miles, knots)
Angular Units:	Degrees, Mils, or Radians
Azimuth:	True or Magnetic North reference

Use WPT switch position to:

4. **Enter Waypoints**

DURING THE MISSION

Display Your Coordinates:	Use FIX or POS switch position
Determine Range & Azimuth:	R+A switch position
Navigate to Another Position:	NAV switch position
Perform Special Functions:	OPS switch position
Show Operation Status:	STS switch position, Status screen

TrimbleNavigation

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Part No. 13737
Revision C

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COORDINATE SYSTEMS

DMS

```
lat   12°34'56.7"N
lon  123°45'59.8"W
```

degrees, minutes, seconds and tenths of seconds

DM.

```
lat   12°34.567'N
lon  123°45.598'W
```

degrees, minutes, minute thousandths

UTM

```
UTM   12    1234567
       X   12345678
```

gridzone number, easting, northing, gridzone letter

MGRS

```
MGRS  12  X
      AB  12345  12345
```

gridzone number, gridzone letter, 100,000m square designation, coordinate code (meters)

FIX AND POS SWITCH POSITION

(MGRS format shown)

```
      SAT  UTC01:00:00
MGRS   12  X
       AB  12345  12345
alt  +    25m    ±300m
```

day of week & time
gridzone
square & coordinate
altitude & accuracy

- If "alt" flashes, displayed altitude is being used for 2-D operation; verify or enter new altitude
- If position labels flash, re-verify altitude

Averaging (if enabled)

averaging indicator →

```
AVG   SAT  UTC14:36:28
lat   12°34'56.7"S
lon  123°45'59.8"E
alt  +12345ft (12345)
```

number of points averaged

- Unit *must* remain stationary during Averaging
- Averaging enabled in OPS switch position

R + A SWITCH POSITION

```
R+A:   A      B      C
azm  123°  234°  321°Tr
rng  1234  12.3  .123Km
vrt   123   -34  1175m
```

any 3 destination waypoints
azimuth
range
vertical difference

NAV SWITCH POSITION

ehicle Navigation

```
0: A    ttg 12:34:56
el 1234KPH    123°Tr
ng1234Km   azm123°Tr
rt  12345m     <more>
```

destination waypoint & time to go
velocity & course over ground
range & azimuth
vertical difference

D Homing

```
0: A    ttg 12:34:56
RIGHT 123°    DN 12°
rg1234Km   azm123°Tr
rt -12345m     <more>
```

destination waypoint & time to go
relative steering angles
slant range & azimuth
vertical difference

tended Track

```
0: A  from: B
RIGHT 123°
ng1234Km   azm123°Tr
te(L) 12345m <more>
```

destination & starting waypoints
relative steering angle
range & azimuth
cross track error

oneer

```
0: C    MASH401
 LEFT 123°
ng 1234Km azm123°Tr
                <more>
```

destination waypoint & label
relative steering angle
range & azimuth

f unit is not doing position fixes, TO: alternates with OLD
f unit is in the Averaging mode, TO: alternates with AVG
Relative steering angle is not computed if unit is stationary; last computed
teering angle is displayed, but is blinking.
When cursor highlights wpt designator, waypoint title appears for search

WPT SWITCH POSITION

```
PT: B ↕BASE CAMP
at  12°34.567'S
on 123°45.598'E
lt +12345ft    <fix>
```

waypoint selection & label

<fix> or <enter> trigger

To copy present position fix into a waypoint, select <fix> and press ▲ INC
To save changes to a waypoint, select <enter> and press ▲ INC
n 1089 waypoint version only, all waypoint designators in all screens use
2 characters

OPS SWITCH POSITION

COPY Function

```
COPY  wpt A  to  B
                <copy>
CLEAR wpt  M thru N
  <clear>       <more>
```

wpt to be copied, wpt overwritten
copy trigger
waypoint range to be cleared
clear trigger

CALC Function (waypoint + range and azimuth)

```
CALC wpt  A from  B
srg 12345.678 Km
azm 123° Tr   <calc>
vta UP12°     <more>
```

wpt loaded with result & starting wpt
entered slant range
entered azm, function trigger
entered vertical angle

DIST Function (show distance between two waypoints)

```
DIST from wpt A
       to wpt B
rng12345Km azm123°Tr
vrt  12345m   <more>
```

waypoint 1
waypoint 2
range & azimuth
vertical difference

AVERAGING Function (control position averaging)

```
AVERAGING ON
(12345)     <restart>

            <more>
```

averaging on/off
number of positions
averaged & restart trigger

STS SWITCH POSITION

Status Screen

```
Tracking 5 SV's
GPS OK     TFOM: 4
Battery used: 1:23
EXT antenna   <more>
```

satellite status
GPS & timing* output messsages
battery usage
antenna in use

Setup Screen

```
Datum:  WGS-84
Time:   LOC=UTC-8
Units:  METRIC  /DEGS
Mode:   DMS/Tr<more>
```

datum
local time offset from UTC
distance units & azm style
coord. style & azm mode

Data Communication Screen

```
Data Port-- TRIMPACK
Wpt  A- B:    <send>
Timing: Have Quick
              <more>
```

data port protocol name
send: *waypoint/almanac/setup parameters*
timing*: *off/pulse per second/static PPS*
Have-Quick/static HQ

• Have Quick option only

MANUAL APPLICABILITY

This manual applies specifically to the newest generation TRIMPACK receivers (part numbers 16768-00 and 16768-10). It can also be used with the previous generation TRIMPACK (part no. 12545-00), with attention to a few differences. The part number label can be found on the back panel of the receiver when the battery pack is removed.

Part No. 16768-XX	Part No. 12545-00
• Waypoint label alpha-numeric search.	• No label search.
• Waypoint saved to next available empty waypoint.	• Specify saved waypoint.
• Almanac, waypoint and setup parameter transfer.	• Almanac and waypoint transfer.
• Dist, Calc for FIX and waypoints.	• Dist, Calc for waypoints only.

ABOUT THIS MANUAL

This manual provides information to quickly familiarize you with the TRIMPACK and enable you to use it to perform positioning and navigation functions. This manual is arranged in three main parts and two appendices which describe TRIMPACK options:

Description: describes the Global Positioning System (GPS) and the TRIMPACK receiver, identifies the controls, indicators, and connectors, and defines basic operations.

Operation: describes how to prepare the TRIMPACK for use, defines the functions it can perform, and provides essential information for each of the display formats.

Maintenance and Reference: describes operator maintenance and provides a list of the reference datums built into the TRIMPACK.

Appendix A: describes the Have Quick/Pulse-Per-Second option.

Appendix B: describes the 1089-Waypoints option.

The manual is organized for ease of use. In most cases, example screens or figures are presented on the left-hand page, and the corresponding text is located on the right-hand page. In the Operation section, the descriptions of the operations are arranged in the same order as the rotary switch positions which select them.

For clarity, the same abbreviations displayed by the TRIMPACK are used throughout the manual; refer to the Glossary for their meanings.

Additional detailed information is provided in the *TRIMPACK Specification, Installation, and Reference Manual,* Trimble Part No. 13498.

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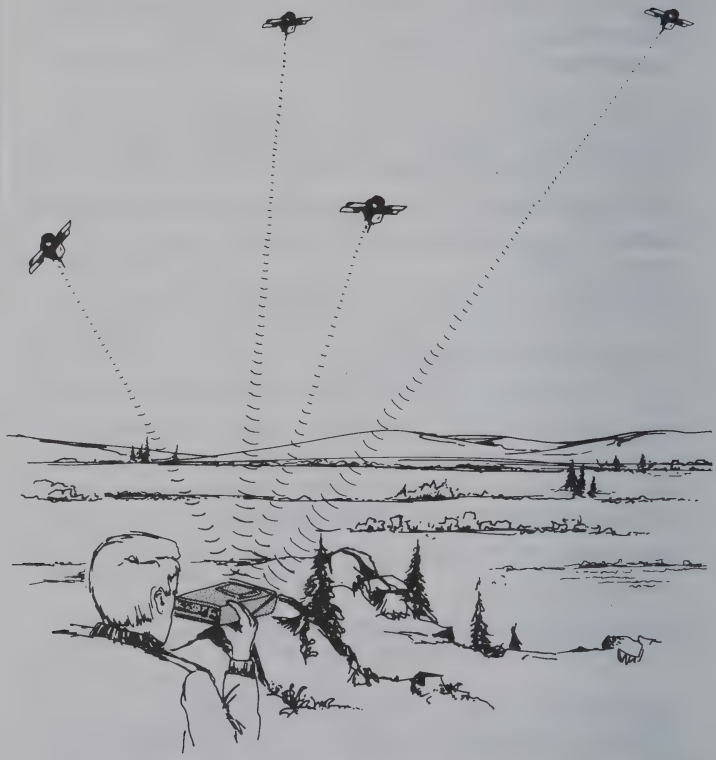
GPS and the TRIMPACK



GLOBAL POSITIONING SYSTEM (GPS)

GPS is a satellite-based radio navigation system. The system ultimately will be a constellation of 21 active satellites and 3 spares in orbits around the earth. This configuration ensures worldwide operation with 24-hour, all-weather coverage. Each satellite transmits data that enables GPS receivers to provide precise position and time.

NOTE

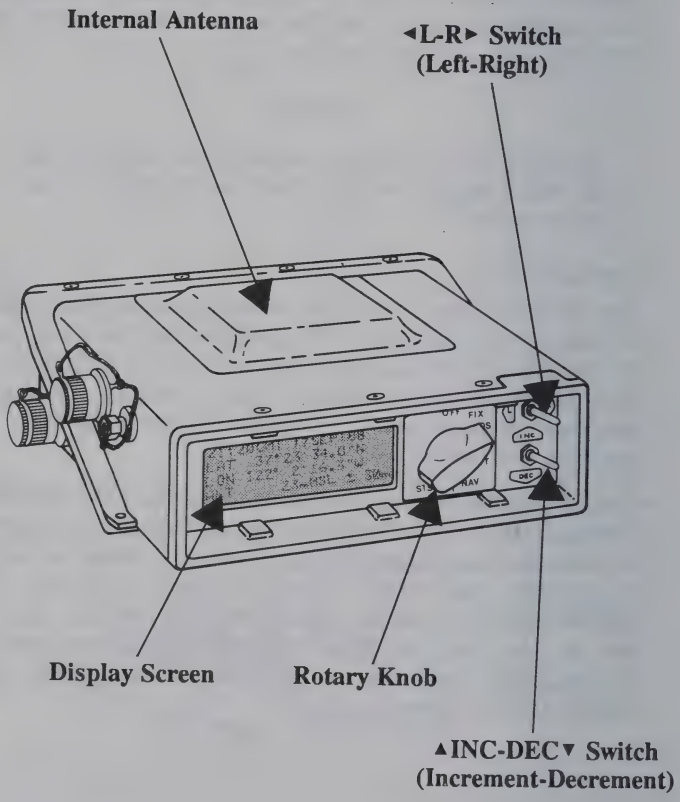
Until the constellation is complete, coverage may be limited to specific hours of each day in certain areas of the world.

TRIMPACK

The TRIMPACK is a hand-held, battery-powered navigation set that receives data from GPS satellites and calculates and displays position, velocity, time, and navigational data. Three-dimensional fixes are obtained when tracking 4 or more satellites; 2-dimensional fixes can be obtained from 3 satellites and user-entered altitude.

The TRIMPACK requires line-of-sight access to the satellite signals. Hold the unit level, with its internal antenna facing toward the sky. GPS navigation signals are similar to light, so anything that blocks light will block or reduce the effectiveness of the signals. The more unobstructed view of the sky you have, the better your set will perform. Avoid placing your hands on or over the antenna when the TRIMPACK is in operation.

CONTROLS and INDICATORS



DISPLAY SCREEN

The TRIMPACK displays information on the backlit 4-line LCD screen. The screen contents are determined by the rotary knob and user-selected options.

ROTARY KNOB

This 8-position switch selects the type of operation that the unit will perform—for example: "WPT" (waypoint) operations.

◂L-R▸ (Left-Right) SWITCH

This 2-way switch is used to select items on the screen (indicated by a flashing box). Momentarily pressing the switch to the *left* or *right* selects different screen items.

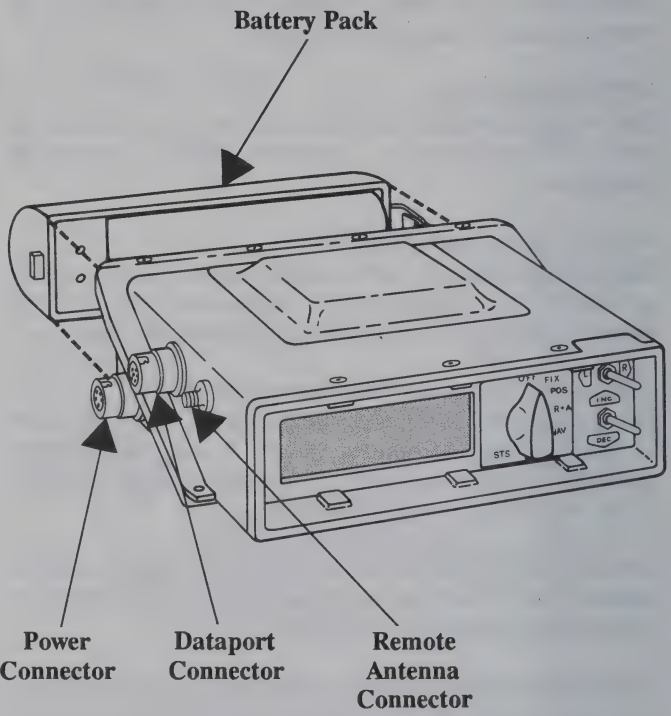
▴INC-DEC▾ (Increment/Decrement) SWITCH

This 2-way switch is used to walk through numbers, letters of the alphabet, or options (as on a list). Momentarily pressing the switch *upward* or *downward* changes the value of the selected item on the screen.

The ▴INC-DEC▾ switch is also used as a trigger when the selected screen item represents an action to be performed (indicated by brackets—<action>).

Both switches automatically repeat at a rapid rate when held on. This feature can be used to quickly roll up to high numbers or to scan past many screen items to select one farther on.

BATTERY PACKS and CONNECTORS



NOTE: Mating cap <u>must</u> be installed on power connector when operating with the battery pack. (Caps are not shown in this figure so that connectors are visible.)

BATTERY PACKS and CONNECTORS

BATTERY PACKS

Three battery packs are currently available to support specific user requirements. To remove or install battery packs, refer to Section 3, *Maintenance* (page 43).

Battery Pack	Battery Type (Qty.)	Continuous Use
13829-00	Nickel Cadmium (rechargeable)	5 hours (16-hrs. to recharge)
13827-00	Lithium BA5800 (2)	21 hours

CONNECTORS

- **Power:** Connects to a 9 to 32V, DC power source. **When operating on batteries, the mating cap must be installed to enable the unit to operate.**
- **Dataport:** Connects for data transfer to another TRIMPACK, a data recorder (computer), or a digital radio channel. When not in use, the connector's mating cap should be installed to keep the connector clean.
- **Remote Antenna:** Refer to *TRIMPACK Specification, Installation, and Reference Manual* for detail on cable requirements. When not in use, its dust cover should be installed to keep the connector clean.

OTHER OPTIONS

- Vehicle mounting brackets are available for the TRIMPACK and remote antenna.
- A neckstrap can be attached by clipping it to the holes on both sides of the TRIMPACK.

COORDINATE SYSTEMS

DMS:

	SUN UTC14:36:28	*day of week & time*
lat	12°34'56.7"S	*latitude*
lon	123°45'59.8"E	*longitude*
alt	+12345ft ±100ft	*altitude & accuracy*

DM.:

	MON UTC14:36:28	*day of week & time*
lat	12°34.567' S	*latitude*
lon	123°45.598' E	*longitude*
alt	- 55ft ±100ft	*altitude & accuracy*

UTM:

	TUE UTC23:59:59	*day of week & time*
UTM	12 1234567	*grid & easting*
	X 12345678	*zone & northing*
alt	+12345ft ±100ft	*altitude & accuracy*

MGRS:

	FRI UTC01:00:00	*day of week & time*
MGRS	12 X	*gridzone*
	AB 12345 12345	*square & coordinate*
alt	- 25m ±300m	*altitude & accuracy*

■ **User-Alterable Field**

COORDINATE SYSTEMS

The TRIMPACK can display position information in any of four coordinate systems. The desired system can be selected from option screens in the STS knob position. Once a coordinate system is selected, all displays use that system. The coordinate systems are described below.

DMS: Latitude/longitude-based system, with position expressed in degrees (°), minutes (′), and seconds (″) to a tenth of a second.

DM.: Latitude/longitude-based system, with position expressed in degrees and minutes. Minutes are displayed to one-thousandth of a minute in decimal form.

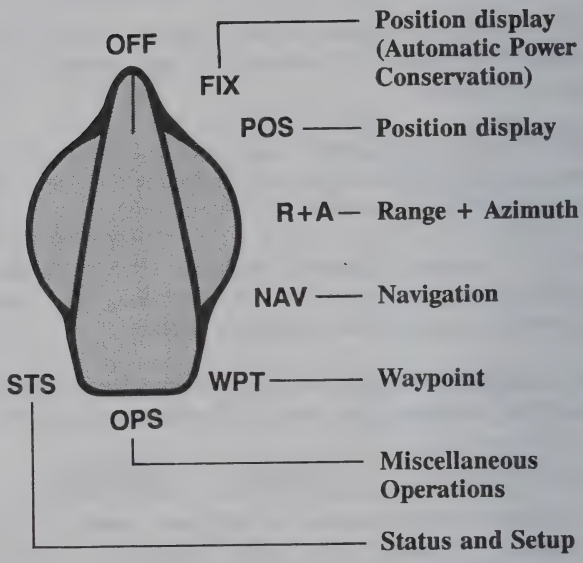
UTM: Universal Transverse Mercator coordinate system, providing the grid zone and the northing and easting component values of the position in meters.

MGRS: Military Grid Reference System, providing the grid zone, the grid square, and the position coordinates in meters.

NOTE

Screen examples shown in the main parts of this manual represent the basic TRIMPACK screens. Screens shown in Appendices A and B illustrate the differences provided by the Have-Quick and 1089-Waypoints options, respectively.

ROTARY KNOB POSITIONS



ROTARY KNOB POSITIONS

To select the type of operation that the TRIMPACK will perform, rotate the knob to:

OFF: The TRIMPACK powers down after 15-second delay.

FIX: Same as POS but saves power by turning off after a time interval.

POS: Displays the most recent position fix.

R+A: Shows range, azimuth, and vertical distance to 3 separate, selectable waypoints simultaneously.

NAV: Provides navigation data to a selected destination waypoint.

WPT: Edit or define 26 waypoints.

OPS: Provides additional functions for manipulating waypoints or controlling the TRIMPACK.

STS: Provides operating status information and allows setting up display options.

The NAV and OPS knob positions have 4 selectable screens; the STS position has 3; all other positions have a single screen.

SETTING UP FOR A MISSION

The TRIMPACK must be set up for the desired display options. These include:

Datum: Choosing one of the 50 reference datums *(see page 44)*

Coordinate System:
Selecting the desired coordinate system to be used:
DMS, DM., UTM, or **MGRS**

Operating Parameters:
Selecting the following:

Time offset:	**UTC** or **Local**
Distance Units:	**English** *(feet, miles, miles per hour),* **Metric** *(meters, kilometers, kilometers per hour),* or **Nautical** *(feet, nautical miles, knots)*
Angular Units:	**Degrees, Mils,** or **Radians**
Azimuth:	**True** or **Magnetic North**

Waypoints: Entering data to define up to 26 waypoints

You can set these options manually, or they can be downloaded to the TRIMPACK from a data loader or another TRIMPACK. Any of these items can also be changed during the mission.

All of these parameters except waypoints are selected from the setup screen of the STS knob position; *see page 39 for detailed information.*

Waypoints are set in the WPT knob position; *see page 31.*

The TRIMPACK can be used to perform the following operations:

Determine Position: Position fixes are calculated approximately once per second. When tracking 4 or more satellites, the fix is 3-dimensional; 3 satellites yield 2-dimensional fixes.

- When the "averaging" feature is enabled, the most recent fix is averaged with previous fixes for higher accuracy. (Note: the result assumes the TRIMPACK is stationary during averaging.)

The FIX and POS knob positions display position fixes; see pages 16-21. The OPS knob position provides the "Averaging" function; see page 35.

Determine Range and Azimuth: The TRIMPACK calculates and displays the range, azimuth, and vertical distance from the present position to any three of the defined waypoints.

The R+A knob position provides this function; see page 23.

Navigate to Another Position: Four selectable screen displays show various information to help navigate from the present position to any waypoint.

The NAV knob position provides these functions; see pages 24-29.

HOW TO CHANGE DATA

Typical Screens

```
      SAT UTC14:36:28
lat   12°34'56.7"S
lon 123°45'59.8"E
alt +12345ft   ±100ft
```

digits are changed individually

letters are changed individually

```
WPT: B   BASE CAMP
lat   12°34.567'S
lon 123°45.598'E
alt +12345ft    <fix>
```

trigger

```
Datum: WGS-84
Time:  LOC=UTC-8
Units: METRIC   /DEGS
Mode:  DMS/Tr <more>
```

settings can be changed

trigger for other screens available

Most screens contain some user-alterable items. These may include numbers, letters, or options that may be changed, or "triggers" that cause an action. In this manual's example screens, the alterable items are shown in reverse type.

On the screen, a flashing box indicates the selected item. Use the ◂L-R▸ switch to select a different item. Pressing the switch once to the *right* selects the next screen item; *left* selects the previous item. At the last item, the next selection returns to the first item on the screen.

Using ▴INC-DEC▾ alters the value of the item or triggers the action. Pressing the switch *upward* once changes the value of the selected item on the screen to the next level; *downward* changes to the next lower value. At the highest value, the next step returns to the lowest value.

CAUTION

The ◂L-R▸ switch only selects screen items; it does not affect their values. However, ▴INC-DEC▾ alters the value of the selected item. Before using ▴INC-DEC▾, make sure the correct item is selected.

SAFETY TIMER

If no switches are pressed for 25 seconds, the selected item stops flashing and ▴INC-DEC▾ has no effect, thus preventing accidental changes. After this occurs, the ◂L-R▸ switch must be used to once again select an item to be changed.

<MORE> TRIGGER

Some rotary knob positions have more than one screen format. The additional screens can be viewed by selecting the <more> trigger (using ◂L-R▸), and then pressing ▴INC-DEC▾ to switch to the next screen.

TURN ON/OFF

TURN-ON

```
 Trimble Navigation
----- TRIMPACK -----

3ch              v2.01x
```

(displayed briefly)

software version

TURN-OFF

```
-OFF in 15 seconds-

 INC/DEC backlight
```

(displayed for 15 seconds)

TURN-ON

Turn the TRIMPACK on by turning the rotary knob to one of the operating positions. A brief sign-on message is displayed, while the TRIMPACK performs a self-test. No switches are active during this time. When the power-on sequence is completed, the rotary knob position determines the type of operation.

TURN-OFF

When you turn the rotary knob to OFF, the screen displays a 15-second countdown before power is turned off. During the 15 seconds, you can return the TRIMPACK to full operation instantly by turning the rotary knob to another position.

BACKLIGHT CONTROL

Pressing ▲INC-DEC▼ during the countdown varies the screen backlight brightness in four steps from off to full.

MEMORY ERASE FUNCTION

The memory erase function lets you instantaneously erase all information stored in the unit.

CAUTION

Use this function only when absolutely necessary. All waypoints, the stored almanac, the time clock, and the last fix are erased from memory. All fields in the 26 waypoints are set to zero. After erasing the memory, the receiver has no knowledge of satellite location; the time required to compute the next fix may be as long as 20 minutes.

Activate the function by holding the ◄L and ▲INC switches simultaneously while turning the rotary knob to the OFF position.

FIX and POS

(MGRS format shown)

	SAT UTC01:00:00	*day of week & time*
MGRS	12 X	*gridzone*
	AB 12345 12345	*square & coordinate*
alt	+ 25m ±300m	*altitude & accuracy*

The same position information is displayed when the rotary knob is set to FIX or POS, but FIX conserves battery use by automatically cutting off power after a time interval.

- When position fixes are in progress, the time interval is 30 seconds.
- If position fixes are not yet being performed (as when the TRIMPACK is first turned on), up to 5 minutes are allowed to obtain a position fix. During the last 30 seconds, a countdown message is shown on the top line of the screen. Moving the rotary knob to a different position stops the countdown. Moving the knob back to FIX restarts the time interval.

The information contained here and on the next 4 pages applies to both the FIX and POS modes.

Line 1 of the display shows the day of the week and the time (a 24-hour clock is used) in either UTC or local time. Local time is not labeled. Lines 2 and 3 show the position coordinates in the selected system (DMS, DM., UTM, or MGR). Line 4 shows the altitude in meters or feet and an estimated accuracy indicator.

ACCURACY INDICATOR

The accuracy figure is rounded to one of the following values:

(Metric)	±30m	±100m	±300m	±1000m	±***
(English)	±100ft	±300ft	±1000ft	±3000ft	±***
(Nautical)	±100ft	±300ft	±1000ft	±3000ft	±***

*** Indicates a value larger than 1000m or 3000ft

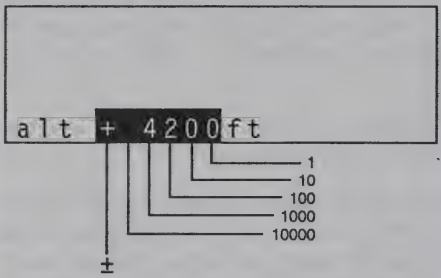
When the TRIMPACK is not doing position fixes, the most recent position fix remains displayed and the accuracy indicator is replaced by the blinking message OLD.

FIX and POS

(DMS format shown)

	SAT UTC14:36:28	*day of week & time*
lat	12°34'56.7"S	*latitude*
lon	123°45'59.8"E	*longitude*
alt	+12345ft ±100ft	*altitude & accuracy*

Altitude Entry



NOTE: Altitude cannot be entered if TRIMPACK is performing position averaging.

Example:
To set altitude to 4200 feet:

- move to ± position and toggle to +
- move to 10,000 position
  - if it already contains a value, set it to 0
  - if it is already at 0, ignore it
- move to 1,000 position and set it to 4
- move to 100 position and set it to 2
- if either the 10 or the 1 position already contains a value, set it to 0; if it is already at 0, ignore it

2-D/3-D OPERATION

In normal operation, the TRIMPACK uses signals from 4 satellites to provide position fixes in 3 dimensions including altitude. If only 3 SVs are available, the calculated positions are 2 dimensional (no altitude); the labels for data items related to altitude flash alternately with the message 2-D. In this case, the accuracy of the fix depends on an accurate estimate of the altitude, whether from the previous 3-D solution or operator entry. The altitude shown should be verified or changed by the user.

If the TRIMPACK has been receiving signals from 4 SVs and loses contact with one of them, it switches from 3-D to 2-D operation. If you do not enter a new altitude value within 30 minutes, or if you move more than about 1 mile from the position of the last 3-D fix, the position labels flash to indicate that you should enter an altitude. When 3-D fixes resume, the TRIMPACK resumes display of the GPS-calculated altitude.

ENTERING ALTITUDE

If the TRIMPACK is providing 2-D fixes, you must manually enter an altitude. The altitude contains a 5-digit number preceded by a sign to indicate above (+) or below (-) sea level. Select the item by using the ◂L-R▸ switch.

Change to the proper sign by pressing the ▴INC switch, then use the R▸ switch to move to the first non-zero digit and toggle in the desired value. If the remaining digits are zeroes, you are done; if other values are required, continue with the R▸ and ▴INC switches until all non-zero values are displayed.

Only altitudes between -500m (-1600ft) and +20000m (65000ft) are allowed.

Averaging

averaging indicator

```
AVG   SAT UTC14:36:28
lat   12°34'56.7"S
lon  123°45'59.8"E
alt  +12345ft (12345)
```

number of points averaged

AVERAGING

The Averaging function averages each new position fix with previous fixes to obtain a more accurate position. The TRIMPACK must remain stationary during averaging.

When Averaging is enabled *(see OPS mode, page 33)*, the top and bottom lines of the FIX and POS mode screens are modified. The label AVG appears in the top left corner to indicate that position fixes are being averaged; on the bottom line, the accuracy indicator is replaced with the number of position fixes averaged since the function was enabled.

CAUTION

If the TRIMPACK is in motion, averaging should be turned off. Averaged position fixes are only meaningful while stationary.

R+A

R+A:	A	B	C	
azm	123°	234°	321°Tr	*azimuth*
rng	1234	12.3	.123Km	*range*
vrt	123	-34	1175m	*vertical difference*

3 destination wpts

The R+A (Range & Azimuth) knob position displays the range, azimuth, and vertical distance from your present position to any 3 of the 26 waypoints (A-Z) on a single screen.

You can display any waypoint in any of the 3 positions. Use the ◂L-R▸ switch to select the waypoint letter and the ▴INC-DEC▾ switch to change it. The TRIMPACK recalculates and displays the new range, azimuth, and vertical displacement to the selected waypoints.

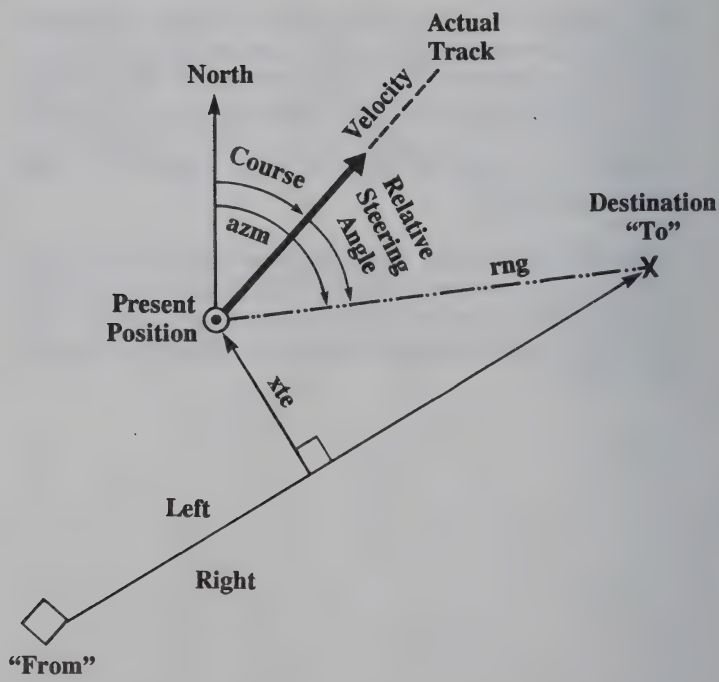
The range is the Great Circle distance from the present position. The vertical height difference can range from 0 to 9999 feet or meters. When a range or vertical displacement exceeds 9999, an asterisk (*) is displayed. The azimuth can be displayed in mils, degrees, or radians (*selectable as described on page 39*) and can be corrected for local magnetic variation.

If the TRIMPACK is not doing position fixes, the R+A label alternates with the word OLD. If the TRIMPACK is in the Averaging mode, the R+A label alternates with AVG. If the TRIMPACK is performing 2-D fixes, the "vrt" label alternates with "2-D."

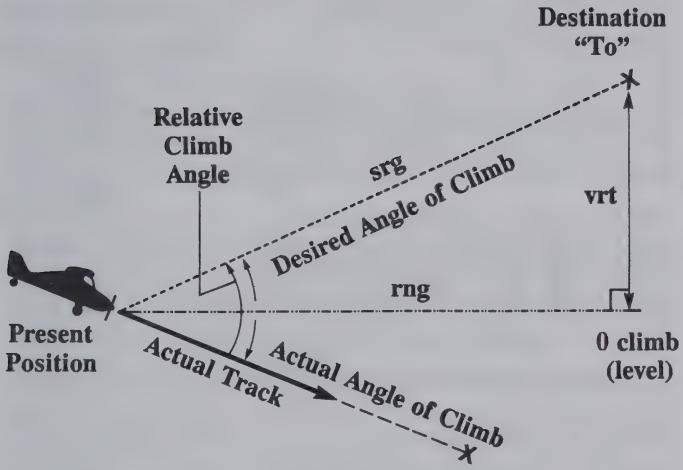
NAVIGATION with TRIMPACK

The figure below shows how the present position is used to derive the range (rng) and azimuth (azm) to the destination and how the velocity is used to find the relative steering angle.

When a "from" waypoint is specified, the cross-track error (*xte*) is calculated as the perpendicular distance from the unit's position to the straight line track between the source and destination.



The figure below shows how the vertical (3-D) data from position and velocity is used to derive the vertical difference (*vrt*), slant range (*srg*), and relative climb angle.



NAV

Pioneer

trigger to search waypoints alphabetically

```
TO: C   MASH401
  LEFT 123°
rng 1234Km  azm123°Tr
                <more>
```

destination wpt & label
*relative steering angle**
range & azimuth

Intended Track

```
TO: A   from: B
 RIGHT 123°
rng1234Km   azm123°Tr
xte(L) 12345m <more>
```

destination & starting wp
*relative steering angle**
range & azimuth
cross track error

While entering "From" waypoint:

```
TO: A  STORAGEDEPOT
FR: B  BENCHMARK205

                <more>
```

***NOTE:** If the TRIMPACK is stationary, the steering angle is not computed. The last steering angle is displayed, but is blinking.

The NAV (Navigation) knob position displays data to help you navigate from your present position to another position. One of 4 navigation screens can be used, depending on your specific application.

When you select the NAV position, the TRIMPACK automatically returns to the most recently used screen format. If you wish to use a different screen, use the <more> trigger to select the desired screen.

In each navigation screen, you need only to enter the destination waypoint. The TRIMPACK automatically displays the data you need to navigate to that point from your present position.

On all four screens, if the TRIMPACK is not doing position fixes, the TO: label alternates with the word OLD. If the TRIMPACK is in the Averaging mode, the TO: label alternates with AVG.

Pioneer Mode: This display provides the basic information required when you are traveling to your destination on foot. Only your selected destination waypoint and label, relative steering angle, range, and azimuth are displayed.

Intended Track Mode: This display format assumes a scenario in which you wish to cross an area on a narrowly defined path. You must enter both a destination waypoint (TO:) and a starting waypoint (FR:). The starting waypoint may be your present position (indicated by an *); the label Pos-at-start appears. Then the relative steering angle, range, azimuth, and cross-track error are shown. The distance your present position is to the left or right of the intended track is indicated by xte(L) or xte(R). XTE is shown in feet or meters if it is less than 2400 ft (600 m), or in miles, kilometers, or nautical miles for longer distances.

3-D Homing

```
TO: A    ttg 12:34:56
 RIGHT 123°    DN 12°
srg1234Km   azm123°Tr
vrt -12345m    <more>
```

destination waypoint & time to go
relative steering angles
slant range & azimuth
vertical difference

Vehicle Navigation

```
TO: A    ttg 12:34:56
vel 1234KPH    123°Tr
rng1234Km   azm123°Tr
vrt  12345m    <more>
```

destination waypoint & time to go
vel & course over grou
range & azimuth
vertical difference

***NOTE:** See NOTE on page 26.

3-D Homing Mode: A typical user might be a parachutist who requires 3-dimensional information. When you select a waypoint, its label and an up/down arrow symbol briefly replace the time-to-go data. After entry, the time-to-go display reappears, along with the horizontal and vertical steering angles, slant range, azimuth and vertical distance to the destination waypoint.

Vehicle Navigation Mode: Line 1 shows the destination waypoint and its associated label during entry; time to go replaces the label after entry of the selected waypoint. Line 2 shows your velocity and course. The range and azimuth to your destination are shown on line 3, and line 4 shows the difference in altitude between present position and your destination.

If the position fixes are in 2-D, the vrt label for vertical distance (on 3-D Homing and Vehicle Navigation displays) alternates with "2-D." Negative vertical distances indicate that the destination waypoint has a lower altitude than your current position.

Refer to the *TRIMPACK Specification, Installation, and Reference Manual,* Part Number 13498, for additional NAV Mode information.

Alphabetic Search: On all NAV and WPT screens, an "up/down" arrow symbol indicates that you can scroll through the waypoint labels alphabetically in either direction. Use the ◂L-R▸ switch to select the up/down arrow and use the ▴INC-DEC▾ switch to scroll through the labels. The Pioneer NAV screen (*page 26*) shows an example of the up/down arrow symbol in line 1.

WPT

DMS Format — *trigger to search waypoints alphabetically*

```
WPT:  B  ↕BASE CAMP
lat   34°40'39.8"N
lon   98°25'14.7"W
alt  +12345ft
```

wpt designator & label
latitude
longitude
altitude

DM. Format

```
WPT:  B  ↕BASE CAMP
lat   34°40.663'N
lon   98°25.245'W
alt  +12345ft
```

wpt designator & label
latitude
longitude
altitude

UTM Format

```
WPT:  B  ↕BASE CAMP
UTM  14   553065
     S  3837262
alt  +12345m   <enter>
```

wpt designator & label
grid & easting
zone & northing
altitude
trigger to save changes made to waypoint

MGRS Format

```
WPT:  B  ↕BASE CAMP
MGRS 14  S
     NP  53066  37262
alt  -     25m     <fix>
```

wpt designator & label
gridzone
square & coordinate
altitude
trigger to copy present position

The WPT (Waypoint) knob position enables you to display or alter data to define up to 26 waypoints (A-Z). The waypoints are displayed in the chosen coordinate system. A waypoint that contains no data has an ---empty--- label.

When you alter a waypoint, an <enter> trigger appears in the bottom right corner of the screen. To save the changes, select the <enter> trigger and press ▲INC. If an error is detected, the waypoint is not saved and an error message is displayed.

Waypoint Labels: The label is up to 12 characters which describe or identify the waypoint. You can create the label by selecting characters and scrolling through the alphabet and numbers by using the ▲INC-DEC▼ switch.

Saving a Fix: When the TRIMPACK is performing position fixes, the fix can be saved into a waypoint by selecting the <fix> trigger (at the bottom right corner of the display) and pressing ▲INC. The data from the present fix is stored in the displayed waypoint if it is empty. If the waypoint is not empty, the data is stored in the next empty waypoint, which is then displayed.

The last 6 characters of the label are changed to reflect the UTC time (time is always displayed as UTC time in this mode) and date (hh [hours], mm [minutes], and dd [day of the month]). If no empty waypoints are available, an error message is displayed and the fix is not stored.

COPY and CLEAR FUNCTON

```
COPY   wpt A   to  B
                <copy>
CLEAR wpt   M thru N
  <clear>       <more>
```

source and destination
copy waypoint trigger
waypoints to clear
clear waypoint trigger

COPY to FIX

```
COPY   wpt A   to fix
                <copy>
03/14/89 11:22 UTC
                <more>
```

source and destination
copy waypoint trigger
date/time for Copy to "fix"

The OPS (operations) knob position provides functions that are useful in support of waypoints and other controls. The four screens are accessed by the <more> trigger.

COPY FUNCTION

The source waypoint cycles from A through Z and FIX (the most recent position calculated by the receiver). When you select the <copy> trigger and press the ▲INC switch, the data from the source waypoint or FIX information is copied to the selected waypoint. If the destination waypoint already contained data, the old data is overwritten. The destination waypoint is automatically incremented to the next waypoint for ease in copying data to multiple waypoints.

The destination waypoint also cycles from A through Z and FIX. When FIX is the destination, date and time fields will appear on the third line with the current date and time from the internal clock. You can modify the date and time if necessary and use the <copy> trigger to initialize the TRIMPACK acquisition algorithm.

CAUTION

The "COPY into FIX" function restarts the TRIMPACK: it should be used with great care. TRIMPACK DOES NOT require initialization.

CLEAR FUNCTION

The clear function on the third and fourth lines allows you to clear any contiguous range of waypoints.

The function is performed by selecting the <clear> trigger and pressing ▲INC.

CALC Function

```
CALC  wpt   A  from   B
srg  12345.678  Km
azm  123°  Tr     <calc>
vta  UP12°        <more>
```

waypoint loaded with result & starting wpt
entered slant range
entered azm & funct. trig.
entered vertical angle

DIST Function

```
DIST  from  wpt  A
        to  wpt  B
rng12345Km  azm123°Tr
vrt   12345m     <more>
```

starting waypoint
ending waypoint
range & azimuth
vertical difference

AVERAGING Function

```
AVERAGING  ON
(12345)      <restart>

                 <more>
```

averaging on/off
number of positions averaged & restart trig.

CALC FUNCTION

The Calculate function is used to generate a position from any one of the stored waypoints and a slant range, azimuth, and vertical angle input; the result is stored in a selected waypoint. The Calc function also accepts "fix" data as the source position. The new position values will overwrite any previous data in the result waypoint.

DIST FUNCTION

The Distance function is used to find the range, azimuth, and vertical difference between any two selected waypoints. "Fix" also is accepted in the distance calculations, enabling observation of a reverse course from a waypoint back to the present position.

AVERAGING FUNCTION

This function can be toggled ON and OFF by selecting the field and then using the ▲INC switch. Use the <restart> trigger to restart the averaging process. Averaging requires the unit to be stationary. Turn off this function when not in use. *(See page 21 for more information.)*

Status Screen

`Tracking 5 SV's`	*satellite status*
`GPS OK`	*condition messages*
`Battery used: 1:23`	*battery usage*
`EXT antenna <more>`	*antenna in use*

The STS (Status) knob position:

- provides continually updated status information concerning GPS reception and condition of the TRIMPACK (Status screen)
- allows you to select the reference datum, operating parameters, and the coordinate system to be used for the mission (Setup Screen)
- enables communication control between TRIMPACK and a data loader or another TRIMPACK (Dataport Control Screen)

The 3 screens are linked by the <more> trigger.

STATUS SCREEN

The Status screen shows GPS and TRIMPACK status.

The first line shows the number of SVs currently being tracked by the TRIMPACK; the number may be 0 if there are no visible or usable satellites.

The GPS status message shows the condition of the reception of the GPS data from the SVs. Possible conditions include GPS OK, GPS N/A (not enough visible or usable SVs), GPS BAD (bad geometry, SV health, or some other reason why position fixes are not possible), RECEIVER FAULT (service required), or MEMORY RESET (memory erase function used).

Line 3 shows hours and minutes of operation of the batteries since the battery pack was last attached.

The last line shows whether the INT (internal) or an EXT (external) antenna is being used.

Setup Screen

Datum:	WGS-84	*datum*
Time:	LOC-UTC-8	*local time offset*
Units:	METRIC /DEGS	*distance units & azm style*
Mode:	DMS/Tr<more>	*coord. style & azm mode*

SETUP SCREEN

This screen allows you to set output parameters according to your requirements. To change any of the parameters, use the ◂L-R▸ switch to select the appropriate item, and use the ▴INC-DEC▾ switch to make the selection.

Datum: Line 1 shows the datum selection. You may select any of the 50 datum choices built into the unit (*see page 44 for the complete list*). For TRIMPACK position fixes to agree with a map, the TRIMPACK datum must match the datum shown on the map.

Time: Line 2 enables you to select either UTC or LOC time and to enter the local time offset value (LOC = UTC ± offset).

Units: Line 3 identifies the units in which distances (METRIC, ENGLISH, or NAUTICAL) and angles (DEGS, MILS, or RADS) are displayed.

Mode: Line 4 shows the selected coordinate system (DMS, DM., UTM, or MGR) and azimuth setting for either True or Magnetic North (Tr or MG).

Dataport Control Screen

```
Data Port:   TRIMPACK
WPT X thru Y:  <send>

                <more>
```

data port protocol name
waypoint sending controls

line 2 can be changed to:

```
Almanac:        <send>
```

or

```
Setup parms:    <send>
```

DATAPORT CONTROL SCREEN

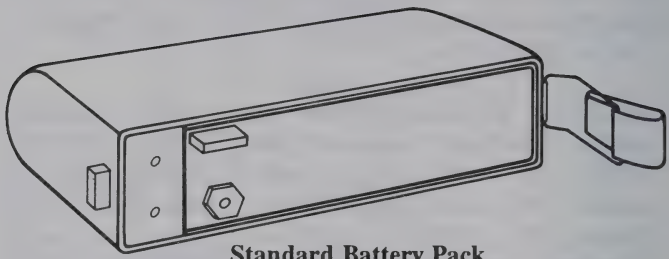
The dataport control screen enables you to control communication between the unit and a data recorder or another TRIMPACK.

Data Port: The data port name can be set to one of three modes: TRIMPACK (the normal setting), OFF, or TPACK-2. When set to TRIMPACK, the unit can communicate with another TRIMPACK. The OFF setting allows silence on the dataport. The TPACK-2 selection is used to send unique data for post-processing differential corrections and is not used in normal operation.

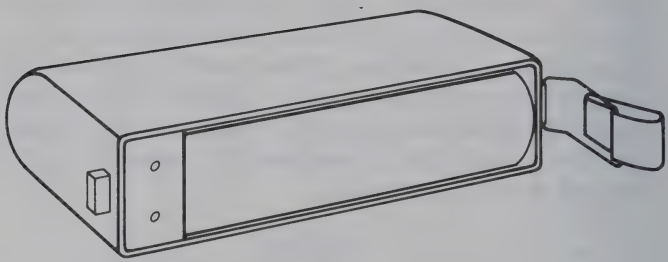
Line 2: The first field on this line enables you to select the type of data to be sent to another unit: waypoints, almanac data, or setup parameters. When sending waypoints, the range of waypoints (for example A - D) can be selected; only waypoints within that range that contain data are transmitted. The selected data is sent when the <send> trigger at the end of line 2 is activated.

NOTE

- No empty waypoints may be included in the range of waypoints to be transferred from a 3-channel TRIMPACK to a 2-channel TRIMPACK. (P/N 12545-00).
- Only the first 26 waypoints can be transferred from a TRIMPACK with the 1089-Waypoints option to a standard 26-waypoint TRIMPACK.



Standard Battery Pack
Rechargeable NiCad



Extended-Life Battery Pack
BA5800 Lithium Batteries (2)

Operator-level maintenance of the TRIMPACK is limited to replacement of batteries.

WARNING

Lithium batteries can be hazardous if not properly handled. Observe the WARNING printed on page iii.

To remove the battery pack from the TRIMPACK:

1. Loosen latch at right-hand rear of TRIMPACK.
2. Pull latch end of battery pack away from back of TRIMPACK, and slide other end out of the retaining clip.

Remove the old batteries and process them for disposal. Install fresh batteries by placing the contact end of the BA5800 into the battery pack first, and then pushing the other end in.

To reinstall the battery pack:

NOTE

The external power connector mating cap must remain in place during this procedure so the battery usage timer will reset to 0:00.

1. Make sure the edge of the battery pack and the mating O-ring in the unit are free of dirt.
2. Slide the end of the battery pack into the retaining clip on the left-hand side of the TRIMPACK case.
3. Carefully seat the pack onto the case and push it into place.
4. Secure the latch on the right-hand side of the case.

DATUM SELECTIONS

Maps are drawn based on a mathematical model of the earth's shape. This is called a datum. For the TRIMPACK's displayed position to agree with corresponding positions on a map, the datum must be selected on the TRIMPACK Setup Screen (see page 39) to be the same as the datum used to draw the map. The map's datum is usually indicated in the map legend or title block.

The following Datums are included in the TRIMPACK. Each name is shown as displayed on the screen.

WGS-84
WGS-72
Adindan
ARC 1950
Australian'84
Bukit Rimpah
CampAreaAstro
CorregoAlegre
Djakarta
European 1950
Geodetic 1949
Ghana
G.Britain '36*
Guam 1963
G. Segara
G. Serindung
Herat North
Hjorsey 1955
Hu-Tzu-Shan
Indian
Ireland 1965
Kertau Malay**
Liberia 1964
Local Astro
Luzon
Merchich
Montjong Lowe
Nigeria (Minna)
NAD-27, CONUS
Alaska/Canada+
NAD-83
Maui, Old HI (Hawaiian)
Oahu, Old HI (Hawaiian)
Kauai, Old HI (Hawaiian)
Qornoq
SAD-69
SierraLeon'60
S.America '56 (provisional)
Prov.CorregoAlegre(S.American)
CampoInchausp (S.American)
Chua Astro (S.American)
Yacare (S.American)
Tananarive'25++
Timbalai
Tokyo
Voirol
Indian SPCL (MGRS)
Luzon SPCL (MGRS)
Tokyo SPCL (MGRS)
WGS-84 SPCL (MGRS)

* Ordnance Survey of G. Britain 1936
** Kertau (Malayan Revised Triangulation)
\+ North American 1927 (Alaska and Canada)
\+ + Tananarive Observatory 1925

Appendix A.
HAVE-QUICK IIA/PULSE-PER-SECOND TIMING OUTPUT OPTION

This appendix describes the additional capabilities and features of the TRIMPACK when equipped with the Have-Quick/Pulse-Per-Second option. Units with this option are identifiable by the black (instead of olive) rotary knob on the front panel. This option provides additional timing outputs from the TRIMPACK dataport: the Have-Quick output or the one-pulse-per-second (PPS) timing output. The desired output is selected on the Dataport Control screen. (For additional detailed information, refer to the *TRIMPACK Specification, Installation, and Reference Manual*, Trimble part no. 13498.) The timing output option affects two of the three STS (status) screens. They are described as follows:

Status Screen

```
Tracking 5 SV's
GPS OK      TFOM: 4
Battery used: 1:23
EXT antenna    <more>
```

satellite status
GPS & timing output messages
battery usage
antenna in use

TFOM/Timing

In the Have-Quick mode, TFOM (time figure of merit) is displayed. This figure ranges from 4 (better than 1 microsecond accuracy) to 8 (less than 10 milliseconds/ unknown). When satellite signals are lost, timing accuracy degrades gradually. In the Pulse-Per-Second mode, "Timing: OK" indicates that the timing is derived from GPS solutions. If not, "Timing: n/a" is displayed.

Dataport Control Screen

Data Port-- TRIMPACK		*dataport protocol name*
Wpt A- B: <send>		*dataport send control*
Timing: Have Quick		*timing mode control*
<more>		

TIMING OUTPUTS

In the Have-Quick option, line 3 provides a selection of timing outputs.

Off: No timing output.

Have-Quick or Pulse-Per-Second: Timing output is based on GPS solutions.

Static HQ or Static PPS: Timing output is based on 1 SV and an accurate known position (previous GPS solutions or user input).

Static Timing

In the static timing modes, TRIMPACK computes only time (**not** position fixes) using only 1 SV. The unit automatically selects the optimum SV for this purpose.

NOTE

Static timing mode should be used only when the accurate position is known. The TRIMPACK will not assume a position and the time measurement will not be valid until:

- the unit has performed a position fix in normal mode and then is switched to static mode; OR
- the user has used the COPY function to store an accurate waypoint into the FIX.

When the unit is operating in static timing mode, STATIC is displayed on the main STATUS screen, as well as on the POS and FIX screens; also, the letters STA alternate with the R&A and TO: labels in the top-left corner of the R&A and NAV screens, respectively. Altitude cannot be entered manually in the static timing mode.

Appendix B.
1089-WAYPOINTS OPTION

This appendix describes the additional capabilities and features of the TRIMPACK unit when equipped with the 1089-Waypoints option.

WAYPOINTS AND THEIR DESIGNATORS

The 1089-Waypoints option increases the storage capacity of the TRIMPACK from 26 to 1089 waypoints. All waypoints on all screens are identified by a two-character designator (AA, AB, etc.), rather than the one-character designator shown throughout this manual. All alphabet and numeric characters are used except for I, O, and 0 (zero). The following screen illustrates the two-character waypoint system.

COPY and CLEAR FUNCTION

COPY wpt AA to AB	*source and destination*
<copy>	*copy waypoint trigger*
CLEAR wpt A5 thru A9	*waypoints to clear*
<clear> <more>	*clear waypoint trigger*

DATA TRANSFER

Only the first 26 waypoints (AA to A2) can be copied from a 1089-waypoint TRIMPACK to a 26-waypoint TRIMPACK

TRIMPACK
WARRANTY RETURN PROCEDURES

1. Call Trimble Navigation, (800) 334-9595 from outside California or (408) 737-6940 from inside California, to request an RMA number. Please have the TRIMPACK serial number ready to give to the Customer Service representative.

2. Write the RMA number here _____

3. Name/Organization/Address/Phone:

_____

_____

_____

_____

4. Complete the Warranty Return Form on the reverse side of this page.

5. Package the equipment and ship prepaid with this page to:

GOVERNMENT OPERATIONS
TRIMBLE NAVIGATION LTD.
617 NORTH MARY AVENUE
SUNNYVALE, CA 94086

TRIMPACK

WARRANTY RETURN FORM

RMA No.: _____

Serial No.: _____

Model/Part No.: _____

Physical Damage: _____

Software:

Screen in Use: _____

Operation Attempted: _____

Problem: _____

Operation/Electrical:

Turn-on/Power: _____

Improper Solution: _____

Specify Position: _____

Datum in use: _____

Operating Conditions: _____

Other: _____

Full description of problem (please be as specific as possible):

_____

_____

_____

_____

QUICK REFERENCE GUIDE

TrimbleNavigation

TRIMBLE NAVIGATION LIMITED
645 North Mary Avenue
P.O. Box 3642
Sunnyvale, California 94086

(408) 730-2900
800-TRIMBLE
Telex: 671393 TRIMBLE UW